

SYSTEM AND METHOD EMPLOYING RESOURCE SHARING TO REDUCE POWER CONSUMPTION BY A NETWORK NODE

TECHNICAL FIELD

[0001] Particular embodiments relate generally to wireless communications and more particularly to a system and method employing resource sharing to reduce power consumption by a network node.

BACKGROUND

[0002] Within an LTE network, a radio base station, which may also be referred to as a network node, includes the hardware and software for connecting wireless devices such as mobile phones with the wireless network. Specifically, a network node may include a digital unit and multiple radio units. A radio unit may be housed in the same cabinet as the digital unit. Alternatively, the radio unit may be a remote radio unit that is self-contained units connected to the digital over extended Common Public Radio Interfaces (CPRI). The digital unit may include a processor, memory, and timing unit that cooperate to provide baseband processing in the control plane and user plane, synchronization, processing for LTE functions such as radio access control and O&M, and other functions. The radio units provide modulation and demodulation of baseband signals to various Radio Frequency (RF) bands and RF power amplification and filtering.

[0003] Within the network node, each radio unit is responsible for transmitting and receiving communications within a distinct cell site or cell sector. As a result, when a radio unit fails, coverage to that cell site is lost until the radio unit can be replaced or fixed. Coverage of a failing radio unit cannot be transferred to an operational radio unit even where the operational radio unit is in under reduced load conditions and is able to handle the additional traffic. Coverage failure and inefficient use of network node resources is a concern for network operators.

[0004] Another concern for network operators is the efficiency or inefficiency of network node components in their consumption of power. The characteristics and configuration of such components can influence the amount of power consumed by the network node. For example, a radio unit that is transmitting with a multi input multi output (MIMO) configuration requires more power than a radio unit transmitting with a single input multi output (SIMO) configuration. Likewise, a radio unit that is transmitting with a SIMO configuration requires more power than a radio unit transmitting with a single input single output (SISO) configuration. However, network nodes are not able to dynamically switch from a MIMO configuration to a SIMO or SISO configuration based on network traffic and load conditions.

[0005] Additionally, the amount of active traffic being handled by a network node also influences the power consumption by the network node. Specifically, a cell site that is fully loaded consumes more power than a cell site that is not fully loaded. In reality, the cell sites in a given market will not be fully loaded 100% of the time. Rather, the cell sites typically experience down time at some point during a 24 hour period. This period of reduced load may include the approximately six hours in a day in which most humans in a market are sleeping. Thus, it is common for the load on the cell sites in a given market area to fall below 25% during at least 25% of the day. In some cell sites, the load may fall to zero,

indicating a no load condition. During such periods of inactivity, the cell sites consume less power than when the cell sites are loaded. However, even under no or low load conditions, some amount of power is required for the transmission of control messages transmitted to maintain coverage and allow subscriber mobility.

[0006] Providing efficient use of network resources while maintaining cell coverage and reducing power consumption remains a concern for network operators.

SUMMARY

[0007] Particular embodiments of the present disclosure may provide solutions to reduce power consumption in a network node based on cell loading. Certain embodiments may include redundancy and resource sharing functionality for reducing power consumption by a network node.

[0008] According to some embodiments, a network node for reducing power consumption includes a transceiver comprising a plurality of radio units. The network node further includes one or more processors and a non-transitory computer-readable storage medium. The computer-readable storage medium includes computer-readable instructions that are configured when executed to determine that physical resource block utilization by a first radio unit is less than a predefined threshold and that at least one condition is present indicating the feasibility of the second radio unit for handling service to the first sector and the second sector. The second radio unit is reconfigured to provide service to the first sector.

[0009] According to some embodiments, a method for reducing power consumption in a network node includes determining that physical resource block utilization by a first radio unit is less than a predefined threshold and at least one condition is present indicating the feasibility of the second radio unit for handling service to the first sector and the second sector. The second radio unit is reconfigured to provide service to the first sector.

[0010] According to some embodiments, a network node for reducing power consumption includes a transceiver comprising a plurality of radio units, one or more processors, and a non-transitory computer-readable storage medium that includes computer-readable instructions. The computer-readable instructions are configured, when executed by the one or more processors, to determine that physical resource block utilization by a first radio unit is less than a predefined threshold and the first radio unit is operating with a multi-input multi-output (MIMO) configuration. The one or more processors also determine that the number of active wireless devices service by the first radio unit is less than a second predefined threshold. The first radio unit is reconfigured to provide service for at least one of the plurality of radio units, and at least one of the plurality radio units other than the first radio unit is disabled.

[0011] According to some embodiments, a method for reducing power consumption in a network node includes determining that physical resource block utilization by a first radio unit is less than a predefined threshold and the first radio unit is operating with a multi-input multi-output (MIMO) configuration. It is also determined that the number of active wireless devices service by the first radio unit is less than a second predefined threshold. The first radio unit is reconfigured to provide service for at least one of the plurality of radio units, and at least one of the plurality radio units other than the first radio unit is disabled.